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REPORT

OF THE

BOARD OF SEWERAGE COMMISSIONERS

OF THE

CITY OF CHICAGO,

FOR THE

HALF YEAR ENDING DECEMBER 31, 1860.



CHICAGO:
PUBLISHED BY THE BOARD.
1861.

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REPORT OF COMMISSIONERS.

SEWERAGE COMMISSIONERS' OFFICE, }
Chicago, April 3, 1861. }

*To the Honorable Mayor and
Aldermen of the City of Chicago,
in Common Council assembled:*

SIRS :

The operations of this Board for the half year ending 31st December, 1860, are exhibited in the accompanying financial statement, and the map and report of the Chief Engineer. To this latter document we would invite careful attention. It contains interesting statements as to the progress of the work thus far, and suggestions as to the continuation and future management of the sewers.

In spite of any practicable precaution some substances, principally sand, will find their way into the sewers, and are not forced out by the flow of water through them. It is hoped that this evil will diminish, however, in proportion as the streets become paved and properly cleansed, although some care and experience will always be required in this regard. It would seem proper that this expense, so immediately connected as it is with the condition of the street surface, should not be chargeable on the funds of this Board, which should be wholly devoted to construction. We would respectfully suggest, that some provision be made to meet the probable expense. It is much more economical to remove this matter from the surface of the streets, than to take it out of the catch-basins or sewers.

In this connection it may be worth while to remark, that this necessity for artificial cleansing has been anticipated from the first. It will be seen by reference to page 10 of our Report of 1855, that we have never expected the sewers to be self-cleansing, as some members of the community suppose. Most of the matter removed from them is, as before intimated, such as should not be there at all. Sand, or the detritus of the paving, is insoluble and heavy, and frequently packs hard, so as not to be readily moved by mere water. Experience shows that those substances, for the conveyance of which the sewers are intended, pass readily off through them, thus showing that the proper functions of the system are well discharged. The inconvenience under consideration, is well understood to attach to some of the sewers of London, Paris, Liverpool and New York, and indeed is practically unavoidable in very flat districts. This subject was very fully considered at the time of the adoption of our plan, and the question decided on grounds of economy.

An abundant and constant stream of water flowing through the sewers, would certainly be beneficial, and bring them more nearly than they now are to being self-cleansing. This was a part of our original plan, and may, whenever it shall appear best, be carried out; but experience shows that the expense now incurred for want of such an arrangement, is less than the interest on the estimated cost of the works which would be necessary to effect it, to say nothing of the cost of maintaining such works.

Length in feet of Sewers laid to December 31st, 1860.

DIAMETER IN FT.	SOUTH DISTRICT.		NORTH DISTRICT.		WEST DISTRICT.		TOTAL FEET.
	Previous to 1860.	1860.	Previous to 1860.	1860.	Previous to 1860.	1860.	
6	.....	.....	3,895	.....	285	1,007	5,187
5	361	.....	4,675	86	14,362	2,687	22,171
4½	.....	.....	.....	.....	2,010	.....	2,010
4	1,952	.....	1,892	3,606	297	4,911	12,658
3	11,863	1,692	3,160	668	.....	.....	17,383
2½	16,270	3,208	.....	.....	.....	.....	19,478
2¼	6,102	257	.....	.....	.....	.....	6,359
2	18,846	1,412	29,574	4,835	25,426	5,003	85,096
1	40,741	23,943	15,703	9,354	17,148	6,355	113,244
	96,135	30,512	58,899	18,549	59,528	19,963	283,586

or very nearly 53½ miles; besides 1,174 catch-basins, with connecting pipes for receiving surface water from the streets; and 2,102 man-holes for entering the sewers.

Twenty-one hundred and ninety-four (2,194) house drains (pipe) have also been laid, and are now in use, connecting with the new sewers. These were laid at the cost of the owners of the lots drained, and under the direction of the Sewerage Commissioners.

FINANCIAL STATEMENT FOR THE HALF YEAR ENDING DECEMBER 31, 1860.

RECEIPTS.

American Exchange Bank.	Proceeds of bonds sold.	\$50,024.00
"	"	"
"	Coupons account.....	25,164.00
Ashley & Norris.	Proceeds of bonds sold	2,016.68
Bills Receivable.	Dickey's note for Sew. Tax, 1859.	3,050.00
City of Chicago.	On acc. Sewerage Tax, 1860	17,402.69
House Drains acc.	Permits issued	1,133.25
Interest and Exchange acc.	Exchange on New York and interest on deposits	1,829.24
Private Drains acc.	Materials, etc	895.30
Wm. Hildebrand.	Int. on Sinking Fund Mortgage.	1,079.87
Timothy Wright.	" " " "	500.00
S. T. Foss.	Money adv. for W. Monroe St. Sewer.	175.00
Robert Stewart.	" " " Green St. Sewer	150.00—\$103,420.03
Divided among the Sewerage Districts, viz:		
South District.....		\$33,263.21
North "		32,572.41
West "		37,584.41—\$103,420.03
Balance Cash on hand 1st July, 1860, as per last statement		103,931.30
Total.....		\$207,351.33

EXPENDITURES.

Advertising acc.	Proposals.....	\$ 47.00
Books and Maps acc.	Engineers' Journal, 2 years.	14.00
Bills Payable.	Temporary loan, paid	10,000.00
Bricks acc.	Sundries	10,904.49
Cement acc.	"	2,966.55
Construction acc.	"	40,342.34
Cleansing Sewers acc.	"	453.84
Implements	" "	77.62
Interest and Exch.	" "	1,514.43
Office Expense	" "	468.00
Sewer Pipes	" "	12,253.76
Salaries	" "	4,750.00
Stationery	" "	42.59
Sinking Fund, loan		3,000.00
Coupons acc.	Sent to American Exchange Bank to pay January coupons	10,700.00
Coupons acc.	Due 1st July last, paid.....	25,164.00—\$122,698.62

Amount forward	\$122,698.62
Expended and charged to Sewerage Districts, viz.:	
South District.....	\$40,821.25
North " 	35,891.40
West " 	45,985.97—\$122,698.62
Balance Cash on hand December 31st, 1860	84,652.71
Total.....	\$207,351.33

INDEBTEDNESS.

Bonds acc. Issued, sold and unsold.....	\$885,000.00
Bills Payable. Temporary loan	30,000.00
Coupons acc.....	65,228.01
Sinking Fund.....	46,831.55
Wm. Smith & Co. Money advanced for Taylor Street Sewer.....	125.00
H. L. Munroe. Money advanced for Wabash Av. Sewer.....	50.00
John Tyrrell. Money advanced for Wabash Av. Sewer.....	25.00
S. T. Foss. Money advanced for West Monroe St. Sewer	175.00
Robert Stewart. Money advanced for Green St. Sewer	150.00—\$1,027,584.56
Incurring and charged to the Sewerage Districts, viz.:	
South District.....	\$384,600.00
North " 	287,177.00
West " 	355,807.56—\$1,027,584.56

CREDITS.

Amer. Exchange B'k. Bonds and cash on deposit..	\$65,986.64
Bills Receivable. City Orders for Sew. Tax 1859..	5,543.25
Cash on hand.....	84,652.51
City of Chicago. Sewerage Tax, 1860.....	60,261.91
Timothy Wright. Sinking Fund Mortgage	13,552.34
Wm. Hildebrand. " " " 	10,600.00
Hiram Joy. " " " 	6,791.18
B. F. Carver & Co. Bonds on deposit.....	50,000.00
Chicago Gas Light and Coke Co. Man-hole covers.	26.00
Patrick Smith and his sureties. Contract work, W. D.	1,296.95
D. Coughlin, " " " " " 	1,561.51— 300,272.29
TOTAL INDEBTEDNESS on account of work at this date.....	\$727,312.27
Materials, Implements, etc., on hand.....	\$13,646.70
\$87,000 of 6 per cent. bonds sold at par of 7 per cents, amount less than face	9,074.10
Interest, Exchange and Commissioners acc.....	39,168.30— 61,889.10
	\$665,423.17

<i>Amount forward</i>	\$665,423.17
Add balance of debits and credits for Sinking Fund and Coupons acs. raised by City Tax, see above.....	20,854.13
Actual cost of the work executed January 1st, 1861, including cleansing Sewers and all preliminary expenses for surveys, maps, plans, etc.	\$686,277.30

BONDS.

1st loan Bonds, six per cents, sold.....	\$ 87,000.00
“ “ seven “ “	413,000.00—\$500,000.00
2nd loan “ “ “ “	307,000.00
“ “ “ “ “	93,000.00—\$400,000.00
Total issued.....	\$900,000.00
Bonds purchased for sinking fund and cancelled, seven per cts.	15,000.00
Total sold and unsold at this date	\$885,000.00

All of which is respectfully submitted.

J. D. WEBSTER, }
 PHILIP CONLEY, } *Sewerage*
 S. LIND, } *Commissioners.*

STATE OF ILLINOIS, }
 COUNTY OF COOK, } ss.
 CITY OF CHICAGO. }

On this twenty-third day of April, A. D. 1861, before me, the undersigned, a Notary Public in and for said city, in said county and State, personally came the above named Philip Conley and Sylvester Lind, Sewerage Commissioners of the City of Chicago, and to me personally known, and having by me been first duly sworn, did depose and say that the foregoing report and statement by them severally subscribed, is a true and just report and statement of facts, according to the best of their knowledge and belief, and further sayeth not.

Witness my hand and Notarial seal the day and year last
 [L. S.] above written.

JAMES B. BRADWELL,
Notary Public.

REPORT OF ENGINEER.

OFFICE SEWERAGE COMMISSIONERS, }
Chicago, April 1, 1861. }

To the Board of Sewerage Commissioners :

GENTLEMEN :

As it is now nearly five years since the construction of the sewers was commenced, and some of them have been in use upwards of four years, it may be asked, what results have thus far been arrived at? This question will be answered by taking up the subject in the following order, viz. :

1. Construction.
2. Maintenance.
3. Effects.
4. Modifications.
5. Suggestions for the future.

1. *Construction.* The principal difficulties met with in the construction, have been quicksand, the necessity of removing water and gas pipes, and, in some cases, the preservation for a time, of old wooden sewers, which not only increased the cost of constructing the brick sewers, but also the cost of maintaining them. These difficulties, however, were not greater than could reasonably have been expected on the whole, although in the matter of removing and repairing water and gas pipes, they have been considerably greater than was actually expected.

The actual cost of the $53\frac{3}{4}$ miles of sewers, together with the catch-basins and man-holes built, is \$686,277.30. This

sum includes the following items, which were not included in the original estimate, viz.:

Books and Maps	\$826.74
Office Furniture	366.83
Preliminary survey expenses.....	2,125.00
Instruments	272.11
Advertising	1,892.28
Incidentals (including \$1,000 for plans)	1,201.42
Stationery	1,248.14
Transportation (traveling expenses).....	2,191.32
Salaries	58,809.95
Office expenses	5,543.83
Cleansing sewers	7,735.78
	<hr/>
	\$82,213.40

Deducting these items leaves the amount, \$604,063.90.

The prices on which the original estimate was based, if applied to the work actually done, would make the following sums, viz.:

5,187 lineal feet of 6 feet sewer, <i>a</i> \$6.00	\$31,122.00
22,171 " " 5 " " <i>a</i> 5.00	110,855.00
2,010 " " 4½ " " <i>a</i> 4.50	9,045.00
12,658 " " 4 " " <i>a</i> 4.25	53,796.50
17,383 " " 3 " " <i>a</i> 3.50	60,840.50
19,478 " " 2½ " " <i>a</i> 1.87½	36,521.25
6,359 " " 2¼ " " <i>a</i> 1.56¼	9,935.93
85,096 " " 2 " " <i>a</i> 1.25	106,370.00
113,244 " " 1 " " <i>a</i> 1.00	113,244.00
1,174 Catch-Basins	<i>a</i> 50.00
	<hr/>
	\$590,430.18

Or \$13,633.54 less than the actual cost of the items included in the original estimate.

It is usual to embrace in original estimates a liberal allowance for contingencies and general expenses, and perhaps it should have been done in this case; but the want of any previous experience in the city rendered any estimates, to say

the least, quite doubtful; and those that were given, were considered as rough approximations only.

A striking illustration of the impossibility of foretelling what work of this kind will cost, is furnished by the following statement of the actual average cost of sewers in 1856 and in 1860, not including general expenses already enumerated.

6 feet sewer, per lineal foot, in 1856, \$5.76—in 1860, \$2.88							
5	"	"	"	"	"	5.39	2.44
4	"	"	"	"	"	5.75*	2.20
3	"	"	"	"	"	3.19	1.45
2	"	"	"	"	"	1.66	.92
1	"	"	"	"	"	1.20	.70

The great differences in the cost of the sewers in the different years of 1856 and 1860 are owing to several causes, viz.:

- 1st. To lower prices of labor and materials.
- 2nd. To greater competition among contractors.
- 3rd. To greater experience among the contractors and workmen, resulting in considerably more being done by an equal force.

2. *Maintenance.* The cleansing of the sewers had cost, up to Jan. 1st, 1861, \$7,735.78. As the length of sewers laid, has increased from year to year, it is too early yet to form a very reliable estimate of the necessary expense of maintenance in future. Judging from what we know now, \$5,000 a year will be ample for cleansing the sewers and catch-basins. But after a year or two more, the man-hole and catch-basin covers will probably begin to require considerable repairs and renewals, for which some \$2,000 a year may be needed.

Whenever the streets are permanently graded, and no further settling of the earth under the pavements is probable, it may be found best to make the man-hole and catch-basin covers of iron, especially if hard stone, block or iron pave-

* The 4 feet sewers this year cost more than the 5 feet, on account of quicksand.

ments should be laid down; but at present, wood is undoubtedly the best material.

As the cost of maintenance must be a permanent item in the annual expenditures of the Sewerage Department, it is peculiarly important to reduce it to the smallest amount consistent with the object for which the sewers were constructed — the health and convenience of the city. It has been the custom to examine, and, if requisite, to cleanse every sewer at least once a year. Some require it twice a year, and, in the vicinity of certain hotels and eating houses, it may be best to flush them three times a year.

The very slight inclination of our sewers caused unusual precaution against failure to be taken in their construction, and it is gratifying to be able to state, that in no instance yet has it been necessary to break open any sewers to remove substances that had found their way into them, except two. One of these sewers had not been accepted from the contractor on account of known defects in the work; and the other had a defect not discovered till after the work was accepted. In both cases the sewers were filled with quicksand which found its way through the defective work.

Unless a sewer is filled entirely full with sand, a thing of very rare occurrence in the past, and which it is believed, will be still rarer in the future, there is no difficulty in removing it with the machinery used for cleansing the sewers.

In order to save as much of the expense of cleansing sewers by machinery as possible, a round tank, capable of holding about 16 barrels of water, was obtained and mounted on a wagon drawn by two horses. It was found that by means of this, the pipe sewers could, in most cases, be flushed clean from the man-holes, and at much less cost than the cleansing by machinery. This very satisfactory result has led to the construction of a much larger tank, rectangular in form, capable of holding about 60 barrels of water, and mounted on a very strong wagon, built especially for the purpose, and drawn by four horses, to be used for flushing the smaller sized brick sewers, as well as the pipes. This has now been in operation

about two weeks, and proves very effective, as it can be emptied in 35 seconds, and promises to diminish the cost of cleansing the sewers, of a less diameter than 3 feet, one-half. It will not however do away the necessity of using machinery; for while it removes bricks, it will not in all cases remove packed sand and earth, except so slowly as to be less economical than machinery.

There is good reason to believe that less and less sand will find its way into the sewers hereafter. As the ground becomes better drained, and the streets are kept in better order, this source of trouble and expense must diminish. This opinion is supported by the fact that the sewers before being cleansed this winter were generally in a better condition than they were before being cleansed a year ago.

Complaints have been made a number of times at the office, of cellars and basements being flooded in consequence of obstructions in the sewers. On examination, the sewers have proved to be free, except in one case, that of a 12 inch pipe filled with sand and marble dust from a stone cutter's yard. The other cases were owing to stoppages in the private drains, caused by the admission of improper substances.

The articles that sometimes are improperly thrown into private drains, are, bottles, vials, spoons, knives, forks, bones, pieces of coal, apples, potatoes, shavings, hay, shirts, towels, stockings, floor cloths, etc. etc. The legal penalties against this reckless practice appear to have little effect; but the annoyance and expense resulting from it in some cases, to owners and tenants of houses, operate strongly in checking it. Most of the stoppages occur in the drains of hotels, and eating and boarding houses. These often empty quantities of melted grease into their drains, which on cooling sometimes chokes them up.

3. *Effects.* The most obvious effect of the sewers has been to make the streets in their vicinity much drier than they used to be. This is particularly the case at the breaking up of winter, and after very heavy rains, at which times much

inconvenience was formerly experienced, where now the annoyances are no greater than they are in other cities similarly situated with regard to pavements.

The subsoil has become drier in the vicinity of the sewers, and consequently there is decidedly less moisture and dampness in cellars and basements than there was formerly; in some cases the difference is so great as to cause frequent expressions of satisfaction from the owners and occupants of houses.

In the report of 1855 accompanying the original plan, it was stated "*the healthfulness of the city* would at once be *greatly benefited* by removing from the surface all stagnant water, if, at the same time, a vigilant police should prevent animal and vegetable substances from being exposed to decay in the streets or lots." This statement was perhaps too strong, and yet, even without such a careful removal of decaying substances from the streets and lots as was considered necessary, the health of the city for the last five years has been unusually good; as the column for Chicago in the following table of mortality will show.

Year.	Boston.	New York.	Philadelphia.	Baltimore.	Charleston.	New Orleans.	St. Louis.	Chicago.
1846	2.59	2.61	1.70	2.35	2.09	4.13	3.80	2.30
1847	3.10	3.46	1.89	2.58	1.82	8.31	4.62	2.88
1848	2.84	4.25	1.92	2.76	2.32	6.95	3.86	2.60
1849	3.79	3.64	2.28	2.84	2.75	8.05	10.62	5.30
1850	2.64	3.07	1.96	2.49	2.85	6.03	5.04	4.72
1851	2.68	4.05	1.97	2.40	2.25	5.25	4.39	2.56
1852	2.52	3.63	2.47	2.79	3.59	5.88	4.44	3.44
1853	2.80	3.64	2.01	2.58	2.39	10.24	3.32	1.99
1854	2.82	4.46	2.39	2.89	4.27	6.57	5.35	5.39
1855	2.54	3.43	2.03	2.65	2.18	....	....	2.46
1856	2.59	3.06	2.40	2.67	2.86	3.82	....	2.17
1857	2.36	3.16	2.09	2.55	2.36	3.93	2.88	2.17
1858	2.25	3.06	2.00	2.64	3.83	7.32	2.92	2.04
1859	2.14	2.82	1.77	2.23	2.55	4.14	3.05	1.75
1860	2.47	2.79	2.04	2.27	3.66	....	3.55	1.88

There is reason to doubt the completeness of the returns of mortality in this city. The law requires the city sexton to report all the burials, but he is dependent upon physicians and the different undertakers for reports of deaths and burials. Some die, however, for whom no physician is called, and no undertaker employed, and consequently no one feels legally bound to report their death. As a comparison of one year with another, the reported deaths may furnish a good basis, but as a comparison with the mortality of other cities, they cannot be depended upon. This is greatly to be regretted; for it is impossible to know whether one city is in a good sanitary condition, as compared with another, without reliable statistics of disease and death.

That the better drainage of the city has promoted the public health there can be no doubt, but of the extent of the benefit there is no certain measure. The Registrar General of England (as quoted in the New York City Inspector's Report for 1860, p. 29) states that the increased average rate of human life in London, from twenty years in the sixteenth century to thirty-seven at the present day, is "attributable principally to the present system of sewerage and drainage," and this too under a system so often, by high authorities, pronounced defective.

The effect on the river has been observed very carefully and with much interest. In a sanitary point of view nothing can be added to the report of July 30th, 1860. The views therein expressed, are such as are now entertained; and there are no new suggestions to make.

Deposits in the river, whether from the sewers or other sources, are observed by carefully sounding at different points, as often as once a year. Where no changes have been made in the width or depth of the river, by dredging or bridging, the depth is very nearly the same that it was in 1855, sometimes a little more, and sometimes a little less. The freshet of 1857 scoured it out so much as to increase the depth two feet in some places, but it has gradually filled up as much since. This shows the importance of diverting as much of

the Aux Plaines water in this direction as can be legally done.

4. *Modifications.* The principal modification, in carrying out the plan of sewerage adopted in 1855, has been the building of large trunk sewers on every second instead of on every third street, in the North and West Districts. In the original plan it was supposed that one in every third street would be sufficient for some time to come, but that it would be necessary ultimately to lay one in each street running east and west in the West District, and the same rule would hold good on several of the streets running north and south in the North District. Soon after commencing the work it was thought best to begin with a trunk sewer on every second street in the North and West Districts. The Wells Street Sewer on the North side, and the Madison Street Sewer on the West side, have been extended further out than any others in those districts.

An unusually heavy rain which occurred on the night of July 28th and 29th last, filled the Wells Street Sewer to above its crown, and the Madison Street to within five inches of its, at Sangamon Street and westwardly; thus showing that the ultimate requirements of those districts were not over estimated.

A practical modification of the original plan consists in omitting the arrangement for flushing the sewers. The interest alone on the estimated cost of this arrangement would be more than the present expense of cleansing the sewers. If the arrangement were carried out, its maintenance would necessarily cost several thousand dollars a year, and could not save all the present expense of removing sand and heavy substances from the sewers by hand or machinery. How much better the atmosphere of the sewers would be if this arrangement were carried out, it is impossible to tell; but it would no doubt be considerably improved. No special annoyance however is felt now, except at the outlets into the river, and at a few catch-basins on and near Cass Street, which

latter annoyances, it is believed, will be remedied soon after the frost leaves the ground, by washing the interior surfaces of the catch-basins with diluted muriatic acid, and immediately plastering them with the best quality of cement, thus rendering them water tight, and causing the traps to operate.

5. *Suggestions.* In view of the transfer to be made soon of the duties of the Sewerage Board to a Board of Public Works, it may be well to make the following suggestions:

1st. With regard to *house drains*. As the usefulness of the sewers depends so much upon the faithfulness with which house drains are laid, past experience shows that this work ought never to be put into the hands of unfaithful or irresponsible persons. In some cases not only individuals have suffered much annoyance, as well as loss, but the sewers have had to be cleansed at an otherwise needless expense. Probably no system better than licensing competent and faithful persons can be devised; but great caution should be used in granting the licenses, for the fact of unfaithfulness is not likely to be known in many cases till its consequences appear, which may not be for a year or two after the work is done and the doer out of the city.

In some streets where sewers have been laid, and some proprietors of buildings drain into them, much annoyance is suffered by such proprietors, in consequence of others emptying their kitchen slops into the street gutters, which become very offensive in warm weather. As the power given by the Sewerage Act to prevent this, is practically limited by certain restrictions, the passage of a city ordinance, making it a penal offence to drain refuse or slops of any kind into the street gutters, where sewers already exist in the street, has been suggested. This seems to be the most ready way of overcoming the difficulty; but there are many streets, or portions of streets, on which sewers have been built, where the houses are of such a class as not to justify the expense of making drains to them, and where no one is more annoyed by

his neighbor than by himself. In other cases such a law might have the effect of causing persons to discharge drainage into their back yards, and thus create a greater nuisance in the neighborhood than the one removed from the street ditch or gutter.

2nd. It is believed the cleansing of the sewers should be thoroughly done, at least once a year, as now practiced. The shorter the time deposits remain in the sewers, as a general rule, the easier they are to remove, and consequently the greater scouring effect of storm water in them. The pipe sewers, in the vicinity of hotels and eating houses, should be flushed at least twice, and in some cases three times a year. The catch-basins should be examined after every heavy storm, and not allowed to contain over one foot in depth of deposit without being emptied.

The best time for cleansing the large sewers is the winter, because then the level of the lake is lowest, the nuisance created by the operation is very slight, and it gives employment to a few laboring men at a season of the year when employment is most difficult for them to obtain—the drawbacks being the shortness of the days, and the intense cold occasionally.

In connection with the cleansing of the sewers is the disposal of the deposit removed from them. In some parts of the city the owners of vacant lots are quite willing to have it put on them, as it is very seldom, even from the beginning, offensive to the smell, and soon ceases to be so to the sight; in fact it generally consists of loam and fine sand, from the ditches and surfaces of the unpaved streets and detritus of the paved ones, very dark in color at first, but in a few days becoming like loam in appearance. In many cases where it could, without serious objection, be spread on the surfaces of unpaved streets, it has never been complained of after having had a few days to become dry. From the paved as well as from some of the unpaved streets, it is necessary to remove it as soon as taken from the sewers to lots which the owners are willing to have filled up.

It is sometimes asked, is not the deposit in the sewers composed of substances from water-closets, and kitchens which are drained into them? Those substances are very generally removed by the current of water flowing through the sewers; and in proof of this statement not only the facts above mentioned may be given, but the additional one, that those sewers which have few or no house drains, but surface drainage only emptying into them, collect as offensive looking deposits as the others, and do so quite as rapidly.

Whenever it becomes necessary to send men into the sewers for any purpose, the precaution to open the man-holes on each side of the part he is to examine or work at, at least ten minutes before he enters, should not be omitted, otherwise serious consequences to the lives of the men may ensue. It is difficult to convince those who have never had any unfortunate experience in this respect of the importance of such a precaution, and there is danger of its being forgotten or neglected in the change of employes. Besides opening the man-holes, there should never be less than one man outside for each man in the sewer, to render assistance in case of need. Thus far we have met with no serious accident of this kind, but in one instance when the opening of a second man-hole was neglected, a man became nearly senseless, and in another an explosion took place, but hurt no one.

3rd. *Pipe Sewers.* At the time our sewerage plan was adopted, a warm controversy was going on in England between the advocates and opponents of pipe sewers. They had never been used to any extent in the United States. It was difficult to know what to decide upon, as the accounts from England, not only with regard to opinions but actual results, were so conflicting. It seemed evident to us that, if properly constructed, and not applied to drainage areas too large for them, they might be safely adopted. The experience of nearly five years confirms this opinion, and shows that they not only cost less money than large brick sewers would have done in the first construction, but are likely to cost materially less in maintenance.

It is very important that the pipe sewers should be faithfully constructed, and it is nearly if not quite impossible to insure this under a contract system. Experience here for several years shows that the pipes are better and more cheaply laid by competent men, employed by the day, than by contract. The brick sewers are generally built cheaper by contract than by the day.

Plans of the Sewers. It has taken a great deal of time and labor to make plans, showing the positions of all the sewers, catch-basins, man-holes, junctions left in the sewers for private drains, and the private drains themselves. These are now very nearly completed as far as the work has been finished. Their importance in the future management of the works is evidently very great, and their loss in case of fire or other casualty would be so serious that it has been thought best to have a copy of them made and kept in a separate building or safe. This set it is believed will be completed during the month of April.

Which is respectfully submitted.

E. S. CHESBROUGH,

Chief Eng'r Sewerage Com'rs.

